Math 667 Spring 2015 Syllabus

Instructor: Professor Stefen Hui, GMCS 523, 594-6197.
Office Hours: TuTh 1215PM-145PM and by appointment
Piazza.com: Please sign up for the course at piazza.com. It is a free service with excellent math typesetting capabilities that are lacking in regular email and Blackboard. All announcements, homework, and math related discussions will be on piazza.com. Please use piazza.com to contact me on all course related materials.
TAs: None
TA Office Hours: None

Prerequisites: Math 534A and Math 534B or equivalent, knowledge of Matlab beneficial but not required.

Calculators: Not required.

Homework: (50%) Approximately one assignment every two weeks.
Project: (25%) The project will be a design and analysis problem that requires the application of the techniques covered in the course. It must be typeset with TeX or LaTeX.
Final: (25%) The problems will be simple conceptual and computational problems on topics covered in the course. The time and location are specified by the University. The exact details will be announced prior to the final.
Scrantron: Not required.

Grades: The grades will be determined by a modified curving procedure with the guarantee that: 90% - A, 80% - B, 70% - C, 60% - D, and below 50% - F.

Homework Policy

You may discuss the problems with your classmates and exchange ideas but you must compose the solutions entirely by yourself. It is acceptable to read outside references on material related to a problem but you should avoid reading solutions of an assigned problem or a closely related problem and you must never copy a solution from an outside source and turn it in as your own.

Mandatory University Senate Statement

If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Disability Services at (619) 594-6473. To avoid any delay in the receipt of your accommodations, you should contact Student Disability Services as soon as possible. Please note that accommodations are not retroactive, and that accommodations based upon disability cannot be provided until you have presented your instructor with an accommodation letter from Student Disability Services. Your cooperation is appreciated.
Assumed Background

1. Good command of the material in Math 534A and Math 534B or equivalent courses.

2. Ability to write clearly and coherently.

Course Description

This course covers the mathematics of linear systems as applied to communication, control, and basic electronics. The course emphasizes the understanding of the key mathematical ideas behind the different techniques and how mathematics, including Fourier analysis and state-space methods, is applied in practical situations. We try to develop the ideas and carry out and apply them to basic systems and circuits.

1. Basic transform methods
   (a) continuous Fourier Transform
   (b) discrete Fourier Transform
   (c) FFT
   (d) using Matlab

2. Basic concepts of linear systems
   (a) input, output
   (b) linearity
   (c) impulse response
   (d) frequency response
   (e) time domain, frequency domain duality
   (f) filters

3. Basic analog modulation and demodulation
   (a) AM
   (b) FM

4. State-space techniques
   (a) state-space equations
   (b) observability and controllability

5. Basic circuits
   (a) resistors, capacitors, inductors
   (b) series and parallel connections
   (c) time domain analysis
   (d) frequency domain analysis
   (e) impulse response and frequency response

6. Applied circuits
   (a) operational amplifiers
   (b) basic topologies
(c) Thevenin Equivalent and Norton Equivalent analysis

7. Analog filters
   (a) definition
   (b) Sallen-Key lowpass filter
   (c) biquad filter
   (d) biquad state variable filter

The homework problems are a mixture of typical mathematical problems and problems requiring Matlab programming. The problems requiring programming are usually computations illustrating the theory and simulations of systems.

Goals and Objectives for Students

1. Know the ideas and applications of the topics listed above.
2. Do the assigned problems independently with some guidance.
3. Can apply the ideas and techniques to other situations.
4. Can explain the main idea in exams.
5. Can solve simple problems in exams.
6. After this course, a student who successfully completes the course is ready to understand and analyze simple analog circuits, including circuits with opamps, design simple digital filters, and solve simple practical signal processing problems.

Respect your classmates’ learning space and right to a conducive learning environment by

- Arriving on time;
- Not leaving before the end of class except for an emergency; leaving early is very disruptive and is strongly discouraged;
- Not texting, web surfing, etc, while in class.